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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,041	01/29/2004	Mamoru Nakasuji	011470A	2576

38834 7590 09/30/2005

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EXAMINER	
JOHNSTON, PHILLIP A	

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 09/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/766,041	NAKASUJI ET AL.
	Examiner	Art Unit
	Phillip A. Johnston	2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 July 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *58-84* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *77-84* is/are allowed.

6)☒ Claim(s) *58-76* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action

1. This Office Action is submitted in response to RCE / Amendment filed 7-05-2005, wherein claims 1-57 were previously canceled, claims 58,59,63,64, and 77-81 have been amended and claims 29. Claims 58-84 are pending.

2. The examiner agrees with applicants remarks filed 7-05-2005 that the amended claims have overcome the obviousness-type double patenting rejection of the previous office action, and is hereby withdrawn. A new obviousness-type double patenting rejection with secondary reference is submitted herein below.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 58-76 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-55 of U.S. Patent No. 6,855,929, in view of Richardson, U.S. Patent No. 4,864,228.

Although the conflicting claims are not identical, they are not patentably distinct from each other because it is obvious to one of ordinary skill in the art that all the limitations in Claims 58-76 of Application No. 10766041, are contained in claims 1-55 of U.S. Patent No. 6,855,929. By way of example, a comparison of Claims 58,70, and 71-73 of Application No. 10766041, with claims 11,12,48 and 49 of U.S. Patent No. 6,855,929 is included below.

Claims 58,70, and 71-73, of Application No. 10766041, read as follows:

Claim 58 (Currently Amended): An electron beam apparatus for irradiating a sample with a primary electron beam, and detecting a secondary electron beam generated from the sample by the irradiation to evaluate the sample surface, comprising:

an electron gun having a cathode for emitting a primary electron beam;

a lens positioned near said electron gun;

an objective lens for accelerating secondary electrons emitted from the sample;

a beam separator for separating said secondary electrons from a primary electron-optical system and directing them toward a secondary electron detector; and

a stage for supporting the sample;

wherein said beam separator is positioned above said objective lens so that the secondary electrons pass through said objective lens and then are deflected and separated from said primary electro-optical system without entering a lens of said primary electro-optical system , and a magnetic deflector for said beam separator is positioned outside of a vacuum wall .

Claim 70 (Currently Amended): An electron beam apparatus according to Claim 63, wherein said stage apparatus comprises:

a non-contact supporting mechanism based on a hydrostatic bearing, and a vacuum sealing mechanism based on differential pumping; and

a partition positioned between a location on the sample surface irradiated with the primary electron - beam and said hydrostatic bearing support of said stage apparatus, for reducing conductance,

wherein a pressure difference is produced between the electron beam irradiated region and said hydrostatic bearing support.

Claim 71 (Currently Amended): An electron beam apparatus according to Claim 70, wherein at least surfaces of parts of said stage apparatus facing said hydrostatic bearing are subjected to a surface treatment for reducing gas emission.

Claim 72 (Currently Amended): An electron beam apparatus according to Claim 63, wherein the sample is carried on a stage apparatus which is accommodated in a housing and supported by hydrostatic bearings with respect to said housing in a non-contact manner; said housing for accommodating said stage apparatus is evacuated; and said electron beam apparatus further comprises a differential pumping mechanism provided around a portion of said electron beam apparatus for irradiating the sample surface with the primary electron beam for evacuating the irradiated region on the sample surface.

Claim 73 (Currently Amended): An electron beam apparatus according to Claim 72, wherein a gas supplied to said hydrostatic bearings of said stage apparatus is dry

nitrogen or highly pure inert gas, said dry nitrogen or said highly pure inert gas being exhausted from said housing for accommodating said stage apparatus, pressurized, and again supplied to said hydrostatic bearing.

Claims 11,12,48 and 49 of U.S. Patent No. 6,855,929 read as follows:

Claim 11. The substrate inspection apparatus in accordance with claim 1, in which said stage is accommodated in a housing of said inspection chamber and supported by a hydrostatic bearing in a non-contact manner, wherein said housing containing said stage is evacuated to vacuum, and a differential pumping mechanism is arranged in a surrounding of a section irradiating the electron beam onto said substrate surface, for evacuating a region on said substrate subject to an electron beam irradiation.

Claim 12. The substrate inspection apparatus in accordance with claim 11, in which a gas supplied to said hydrostatic bearing of said stage is either of a dry nitrogen or a highly purified inert gas, wherein said dry nitrogen or said highly purified inert gas, after having been exhausted from said housing containing said stage, is pressurized and supplied again to said hydrostatic bearing.

Claim 48. A substrate inspection apparatus comprising:

a. a beam source for emitting an electron beam having a specified width;

b. a primary electron optical system for introducing said electron beam to a surface of a substrate subject to an inspection;

c. a secondary electron optical system for guiding secondary electrons emitted from said substrate to a detecting system;

d. an image processing system for forming a secondary electron image based on a detection signal of a secondary electron beam obtained by said detecting system;

e. a state for holding said substrate in such a manner that said substrate may be moved successively with at least one degree of freedom;

f. an inspection chamber for said substrate;

g. a substrate conveying mechanism capable of carrying said substrate into said inspection chamber and taking out it therefrom;

h. an image processing analyzer capable of detecting a defective location on the substrate loaded into said inspection chamber based on the secondary electron image formed by said image processing system;

i. a vibration isolating mechanism for said inspection chamber;

j. a vacuum system capable of controlling a vacuum atmosphere to be maintained in said inspection chamber; and

k. a control system for indicating and/or storing said defective location on said substrate detected by said image processing analyzer, and in which said stage is provided with a non-contact supporting mechanism by means of a hydrostatic bearing and a vacuum sealing mechanism by means of a differential pumping, and a divider is arranged between a location on said substrate subject to the electron beam irradiation and a hydrostatic bearing supporting section of said stage so as to reduce a conductance, so that a pressure difference may be generated between the electron beam irradiated region and said hydrostatic bearing supporting section.

Claim 49. The substrate inspection apparatus in accordance with claim 48, in which said divider includes a differential pumping structure built therein.

Claims 1-55 of U.S. Patent No. 6,855,929 do not disclose a magnetic deflector for a beam separator positioned outside of a vacuum wall, as recited in claim 58. However, Richardson (228) discloses at Column 4, line 45-64 that, magnetic deflection coils are usually located outside the vacuum chamber of electron microscopes. Therefore it would have been obvious to one of ordinary skill in the art that the electron beam apparatus of U.S. Patent No. 6,855,929, can be modified to include magnetic deflection coils outside the vacuum wall as disclosed in Richardson (228).

Therefore it is obvious to one of ordinary skill in the art that all the limitations in claims 58-76 of Application No. 10766041 are for the most part, contained in U.S. Patent No. 6,855,929 in view of Richardson (228).

5. Claims 58-76 are also rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-60 of U.S. Patent No. 6,593,152 , in view of Richardson (228).

Although the conflicting claims are not identical, they are not patentably distinct from each other because it is obvious to one of ordinary skill in the art that all the limitations in Claims 58-76 of Application No. 10766041, are contained in Claims 1-60 of U.S. Patent No. 6,593,152

By way of example, a comparison of Claims 58,70, and 71-73 of Application No. 10766041, with claims 35,36,41, and 59 of U.S. Patent No. 6,593,152 is included below.

Claims 58,70, and 71-73 of Application No. 10766041, are shown above. Claims 35,36,41, and 59 of U.S. Patent No. 6,593,152 read as follows:

Claim 35. An electron beam apparatus according to claim 1, further comprising a stage apparatus for carrying the sample thereon, the stage apparatus comprising: a non-contact supporting mechanism based on a hydrostatic bearing, and a vacuum sealing mechanism based on differential exhaustion; and a partition positioned between a location on the sample surface irradiated with the primary electron beam and the hydrostatic bearing support of the stage apparatus for reducing conductance, whereby a pressure difference is produced between an electron beam irradiated region and the hydrostatic bearing support.

Claim 36. An electron beam apparatus according to claim 35, wherein the partition contains a differential pumping structure.

Claim 41. An electron beam apparatus according to claim 1, wherein, the stage apparatus for carrying the sample thereon is accommodated in a housing and supported by the hydrostatic bearing with respect to the housing in a non-contact manner; the housing for accommodating the stage apparatus is evacuated; and the electron beam apparatus further comprises a differential pumping mechanism provided around a portion of the electron beam apparatus for irradiating the sample surface with the primary electron beams for evacuating the irradiated region on the sample surface.

Claim 59. A sample evaluation method according to claim 49, further comprising: supporting a stage apparatus for carrying the sample thereon in a housing by a

hydrostatic bearing in a non-contact manner; evacuating the housing containing the stage apparatus; and exhausting the irradiated region on the sample surface by a differential pumping mechanism provided around a portion of the electron beam apparatus for irradiating the sample surface with the primary electron beams.

Claims 1-60 of U.S. Patent No. 6,593,152 do not disclose a magnetic deflector for a beam separator positioned outside of a vacuum wall, as recited in claim 58. However, Richardson (228) discloses at Column 4, line 45-64 that, magnetic deflection coils are usually located outside the vacuum chamber of electron microscopes. Therefore it would have been obvious to one of ordinary skill in the art that the electron beam apparatus of U.S. Patent No. 6,593,152, can be modified to include magnetic deflection coils outside the vacuum wall as disclosed in Richardson (228).

It is obvious to one of ordinary skill in the art that all the limitations in Claims 58-76 of Application No. 10766041 are for the most part, contained in Claims 1-60 of U.S. Patent No. 6,593,152, in view of Richardson (228).

Allowed Claims

6. Claims 77-84 are allowed.

Examiner's statement of reasons for allowance

The following is an examiner's statement of reasons for allowance:

7. Claim 77 is allowed because prior art fails to show a method of evaluating a sample, using an electron beam apparatus comprising:

preparing a plurality of standard marks having different line and space patterns:

selecting one of standard marks, which has a line and space pattern corresponding to a width of a line on the sample to be evaluated; irradiating the selected standard mark with a plurality of electron beams having different diameters at a pluralitv of times, respectively; detecting secondary electron beams emitted from the selected standard mark at the respective irradiation times to evaluate S/N ratios; selecting a diameter from the different diameters of the irradiated electron beams with which a maximum S/N ratio has been obtained in the S/N ratio evaluation; irradiating said sample with a primary electron beams beam having the selected beam diameter; detecting a secondary electron beam generated from the sample by the irradiation; and evaluating the sample.

8. Claims 78-84 are allowed by virtue of their dependency upon allowed claim 77.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Claims Rejection – 35 U.S.C. 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 58, 60-62, and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,038,018 to Yamazaki, and Richardson, U.S. Patent No. 4,864,228.

Yamazaki (018) discloses an electron beam inspection apparatus that includes the following;

(a) An electron gun for emitting a plurality of electron beams, spaced apart at equal intervals to scan a semiconductor wafer, and a deflector 27 for deflecting secondary electrons toward the secondary optical system, that incorporates an E x B filter above the objective lens system 14, having coils 41a and 41b, equivalent in the shape of a toroid as recited in claims 58, 61, and 68. See Column 10, line 42-55; and figure 9 below;

(b) Imaging with a TDI-CCD detector synchronized with stage movement, as recited in claim 60. See Column 7, line 56-62;

(c) When the sample 11 is irradiated with the primary electron beams 31, the secondary electrons, the reflected electrons and the backward scattered electrons, are emitted from the surface of the wafer 11. The rotation-symmetry type electrostatic lens 14 generates an acceleration electric field, so that the electrons are led and thereafter accelerated in the direction perpendicular to the surface of the sample 11, as recited in claim 62. See Column 6, line 11-32;

(e) Beam intensity detection and control, as recited in claim 61. See Column 9, line 20-23;

11. Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki (018) and Richardson (228), in view of Nakagawa, U.S. Patent No. 4,431,915.

The combination of Yamazaki (018) and Richardson (228) fails to teach a saddle shaped deflector coil. However, Nakagawa (915) discloses an electron beam apparatus that includes saddle shaped deflection coil 20. See Column 2, line 54-61.

Therefore it would have been obvious to one of ordinary skill in the art that the electron beam inspection apparatus and method of Yamazaki (018) and Richardson (228), can be modified to use the saddle shaped deflector of Nakagawa (915), to provide a deflection coil where the degree of electron beam deflection in the direction X and Y, is equalized for easy selection and control of deflection signals in rotating an image based on scanning rotation, thereby providing an electron beam apparatus free from specimen image shift.

12. Claims 63-67, and 69-76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki (018), and Wada, U.S. Patent No. 6,586,753 in view of Petric U.S. patent No.4,528,451, and in further view of Tanaka, U.S. Patent No. 6,509,957.

Yamazaki (018), as described above discloses nearly all the limitations of claims 63-67, and 69-76 including;

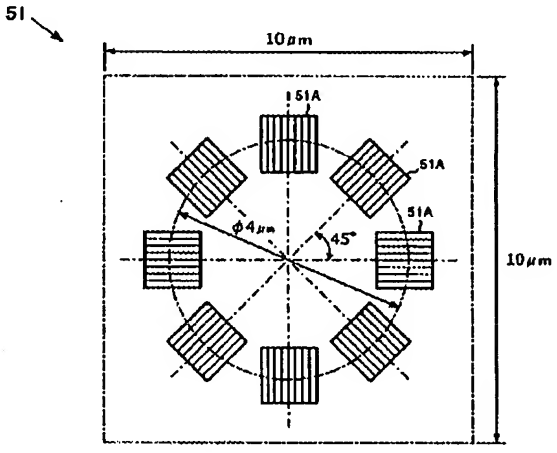
(a) Defect detection and image processing by image comparison, as recited in claim 69. See Column 5, line 39-57; and Column 13, line 3-18;

(b) Voltages applied to the wafer surface using power source 45, as recited in claim 67. See Column 2, line 6-23; Column 6, line 56-64;

(c) Performing wafer inspection, as recited in claims 75 and 76. See Abstract.

Yamazaki (018) fails to teach an electron beam apparatus having a plurality of particular patterns selected and used to determine the beam diameter that provides the maximum S/N ratio. However Wada (753) discloses an electron beam apparatus having reference cell 50 that includes plural test patterns 51 with plural line and space patterns 51A, where during irradiation of target 50, the output is detected to measure and adjust beam diameter, focus, astigmatism, and beam axis compared to predetermined (stored) values, as recited in claims 63-66, and 69. See Column 6, line 11-45; and Figure 5 below.

Fig.5

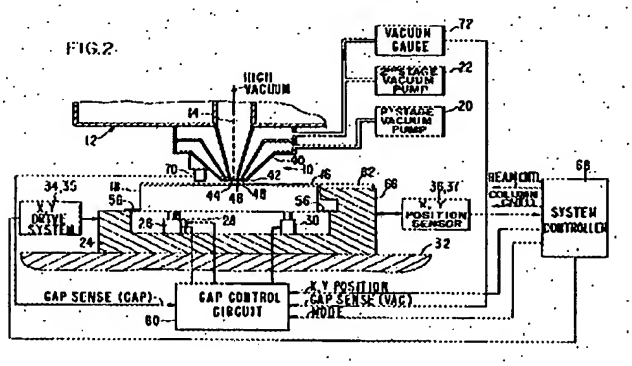


Therefore it would have been obvious to one of ordinary skill in the art that the electron beam inspection apparatus and method of Yamazaki (018), can be modified to use the reference pattern of Wada (753), to provide an electron beam apparatus

that is designed to provide a predetermined beam diameter, a precise adjustment required for an optical axis (electron beam axis) for achieving the design performance.

The combination of Yamazaki (018) and Wada (753) fails to teach the use of a partition for reducing conductance and the use of differential pumping for evacuating the irradiated region on the sample surface, as recited in claims 70 and 72. However, Petric (451) discloses an envelope apparatus 10 that provides a partition between vacuum zone 44 and the working chamber, where the envelope apparatus 10 includes annular aperture 48, which is coupled to the first stage vacuum pump 20, which reduces the pressure (differentially pumped) around the vacuum zone 44 to a low vacuum level. See Column 4, line 52-68; and Figure 2 below.

Therefore it would have been obvious to one of ordinary skill in the art that the electron beam inspection apparatus and method of Yamazaki (018) and Wada (753), can be modified to use the differentially pumped vacuum envelope of Petric (451), to provide a low conductance gap between the vacuum tip and the wafer surface so that the irradiation vacuum zone can be differentially vacuum pumped to a low vacuum level, thereby providing the required vacuum level for wafer processing.



The combination of Yamazaki (018), Wada (753), and Petric (451) fails to teach the use of a loader for supplying a sample to the stage apparatus and the use of dry nitrogen in the hydrostatic bearings, as recited in claim 74. However, Tanaka (957) discloses in FIG. 3, a wafer loader compartment 48 having an inner loader chamber 46 is disposed adjacent to the compartment 42 that has the wafer chamber 40.

The wafer stage is supported by a hydrostatic bearing and a hydrostatic pressure of pressurized gas (e.g., helium or nitrogen gas, or the like) emitted from the bearing surfaces of the vacuum preload hydrostatic bearing devices. See Column 15, line 3-8; Column 23, line 46-60.

Therefore it would have been obvious to one of ordinary skill in the art that the electron beam inspection apparatus and method of Yamazaki (018), Wada (753), and Petric (451), can be modified to use the stage device of Tanaka (957), to provide a wafer stage that is non-contactingly supported with approximately several microns of clearance above the moving surface, where the wafer replacement shock force is eliminated, thereby preventing generation of a positional shift to an object mounted on the moving member.

Conclusion

13. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 6:30 am to 3:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee

can be reached at (571) 272-2477. The fax phone number for the organization where the application or proceeding is assigned is 571 273 8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ

September 28, 2005

JOHN R. LEE
SUPERVISORY PATENT EXAMINER
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